



**RELIABILITY ANALYSIS OF A WEB-BASED EXPERT SYSTEM USING
FORWARD CHAINING FOR ASSESSING DIABETIC FOOT ULCER
INFECTION RISK**

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ABSTRACT

A web-based expert system application using the Forward Chaining method has been developed to assist medical professionals in determining the risk scale of diabetic foot infection. Diabetic foot ulcers are a serious complication that requires early detection and accurate risk assessment to prevent further complications such as amputation. The reliability of this application needs to be evaluated to ensure its consistency and dependability in providing medical recommendations. This study aims to analyze the reliability of a web-based expert system application using the Forward Chaining method in determining the risk scale of diabetic foot infection. This research employs a quantitative approach, collecting data from 50 respondents who evaluated four main aspects of the application: Usefulness, Ease of Use, Ease of Learning, and Satisfaction. Reliability analysis was conducted using Cronbach's Alpha with the assistance of SPSS software. The analysis results show a Cronbach's Alpha value of 0.950, indicating that the application has excellent reliability. All four measured aspects are consistent in assessing the application's quality. The web-based expert system application using the Forward Chaining method developed for determining the risk scale of diabetic foot infection has excellent reliability. The application can be relied upon to provide consistent and accurate recommendations in medical risk assessment.

Keywords: cronbach's alpha; diabetic foot ulcer; expert system; forward chaining; reliability

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INTRODUCTION

An expert system is a type of artificial intelligence (AI) application designed to emulate the decision-making capabilities of a human expert in solving specific problems (Russell & Norvig, 2020). Expert systems have been utilized in various fields including medicine, finance, education, and engineering to support complex decision-making processes (Giarratano & Riley, 2021). With technological advancements, expert systems can now be implemented on web-based platforms, enabling broader accessibility and ease of use (Laudon & Laudon, 2020). The implementation of web-based expert systems has opened new opportunities in healthcare, particularly in supporting diagnosis, treatment planning, and patient risk management (Topol, 2019). The Forward Chaining method is an inference technique commonly used in expert systems. It begins with known facts and proceeds toward a conclusion by applying predetermined rules (Giarratano & Riley, 2021). This method is particularly effective for problems that require reasoning from data to solutions, such as medical diagnosis or strategic planning (Russell & Norvig, 2020). In healthcare, Forward Chaining has been employed to develop clinical decision support systems that assist healthcare providers in assessing risk and determining appropriate medical interventions (Sutton et al., 2020).

The web-based expert system application developed in this study utilizes the Forward Chaining method specifically to determine the risk scale of diabetic foot ulcer infection.

Diabetic foot ulcers are serious complications frequently experienced by individuals with diabetes mellitus (Bates et al., 2014). According to the International Diabetes Federation (IDF), approximately 19–34% of individuals with diabetes will develop a diabetic foot ulcer during their lifetime, and 50% of these cases are at high risk of infection, potentially leading to amputation (Zhang et al., 2020). Early detection and accurate infection risk assessment are essential to prevent further complications such as amputation and to improve patients' quality of life (Topol, 2019). Although web-based expert system applications using the Forward Chaining method have been developed, it is essential to evaluate their reliability to ensure they consistently measure user quality. Reliability is a critical aspect that must be tested to confirm that the application produces consistent and trustworthy results (Bujang, et al, 2018). Without strong reliability, the application cannot be trusted to provide accurate recommendations for diabetic foot ulcer infection risk assessment. Moreover, in the healthcare context, accuracy and system reliability are paramount, as errors in risk assessment can have serious consequences, including delayed treatment or inappropriate medical actions (Ammenwerth & Shaw, 2019). Therefore, reliability analysis is crucial not only for ensuring application quality but also to guarantee that the system can be confidently used by healthcare professionals and patients. This study aims to analyze the reliability of a web-based expert system application using the Forward Chaining method by applying Cronbach's Alpha. This analysis will help determine the extent to which the application is dependable in measuring user satisfaction. Additionally, the study seeks to provide recommendations to application developers for improving system quality and reliability.

METHOD

This study uses a quantitative approach by collecting data from 50 respondents who have used the web-based expert system application. Respondents were asked to evaluate four main aspects of the application: Usefulness, Ease of Use, Ease of Learning, and Satisfaction. Data were collected using a questionnaire consisting of four items, each measured using a 1–100 Likert scale. Higher scores indicate a more positive perception of the application. Reliability analysis was conducted using the Cronbach's Alpha method to measure the internal consistency of the items.

RESULT

Analysis using SPSS yielded a Cronbach's Alpha value of 0.950. This result indicates that the web-based expert system application utilizing the Forward Chaining method has excellent reliability. A summary of the results is presented in table 1:

Table 1.
Reliability Statistic

Reliability Statistic	Value
Cronbach's Alpha	0.950
Number of Items	4

DISCUSSION

The Cronbach's Alpha value of 0.950 demonstrates that the developed web-based expert system application using the Forward Chaining method for assessing the risk scale of diabetic foot ulcer infection has excellent reliability. This aligns with previous studies indicating that web-based expert systems can effectively support diagnosis and patient management, particularly in medical risk assessment (Sutton et al., 2020). Usefulness: The Usefulness aspect reflects that users consider the application highly valuable in determining the infection risk scale of diabetic foot ulcers. According to Davis (1989), usefulness is a key factor influencing user acceptance of technology. The high usefulness score obtained in this study indicates that the application assists healthcare professionals in making timely and accurate decisions, which is critical in diabetic foot ulcer risk assessment (Topol, 2019).

Ease of Use: The Ease of Use aspect also received high ratings, indicating that users found the application easy to operate. Ease of use is vital in technology adoption, especially in healthcare, where practitioners often have limited time to learn new systems (Venkatesh et al., 2016). **Ease of Learning:** The Ease of Learning aspect reveals that users found the application easy to learn. This is important since the application targets healthcare workers who may not have strong technical backgrounds (Kohli & Tan, 2016). **Satisfaction:** The Satisfaction aspect indicates that users were satisfied with the application. User satisfaction is a critical indicator of a system's success, as high satisfaction levels contribute to continued use and word-of-mouth recommendations (DeLone & McLean, 2003). Despite the positive results, several limitations must be noted. First, the study involved only 50 respondents, limiting the generalizability of the findings. Second, the study only measured application reliability; further research is needed to assess the validity and effectiveness of the application in real clinical settings.

CONCLUSION

The web-based expert system application using the Forward Chaining method developed for determining the risk scale of diabetic foot infection has excellent reliability. The application can be relied upon to provide consistent and accurate recommendations in medical risk assessment.

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